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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

LAU, TUNG S

ART UNIT PAPER NUMBER

2863

DATE MAILED: 10/20/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/996,399

Applicant(s)

SOLECKY ET AL.

Examiner

Tung S Lau

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 September 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 6-35 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 6,7,9-15 and 17-35 is/are rejected.
- 7) ☒ Claim(s) 8 and 16 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 6, 17, 25, 28, 31, 32, 7, 9, 10, 11, 12, 13, 14, 15, 18, 21, 22, 23, 24, 19, 20, 26, 27, 29, 30 are rejected under 35 U.S.C. 102(e) as being anticipated by Kikuchi (U.S. Patent Application 2002/0042664).

Regarding claim 6:

Kikuchi discloses a method for evaluation of target structural features on a substrate, said method comprising (a) providing a calibration database comprising (i) information elements selected from the group consisting of (A) information elements describing a functional performance characteristic of respective reference structural features on a substrate (abstract), and (B) information elements describing a physical characteristic of each of said respective reference structural features, or both types of information elements (page 3, section 0026-0031), and (ii) information elements describing feedback from said respective reference structural features as a function of position over

each of said respective reference structural features (page 1, section 0008-0009), (b) providing at least one weighting function as a function of position over each of said respective reference structural features and at least one correlation function as a function of position over each of said respective reference structural features (page 3, section 0032), wherein a plurality of weighting functions and/or correlation functions is provided (page 3, section 0033-0034), (c) determining a combination of weighting function and correlation function from said provided which provide a desired degree of correlation between said information elements (i) and (ii) for respective reference structural features (page 3, section 0031-0036, page 6, section 0057), (d) providing information elements describing feedback from said target structural features as a function of position over each of said respective target structural features on said substrate (page 3, section 0036-0037), and (e) applying said combination of weighting function and correlation function to said target structural feature information elements to predict said functional performance characteristic of respective target structural features and/or to describe said physical characteristic of respective target structural features (page 3-4, section 0032-0038, page 6, section 0057, page 30, section 0350, page 20, section 0229-0230).

Regarding claim 17:

Kikuchi discloses a method for evaluation of target structural features on a substrate, said method comprising (a) providing information elements describing

feedback from said target structural features as a function of position over each of said respective target structural features on said substrate (page 3, section 26-30), (b) applying a combination of a weighting function and a correlation function to said target structural feature information elements to predict a functional performance characteristic of respective target structural features and/or to describe a physical characteristic of respective target structural features (page 3, section 0032-36, page 30, section 0350, page 20, section 0229-0230).

Regarding claim 25:

Kikuchi discloses a system for evaluation of target structural features on a substrate, said system comprising (a) a calibration database in a computer-readable medium (fig. 1, unit 130,120), said database comprising (i) information elements selected from the group consisting of information elements describing a functional performance characteristic of respective reference structural features on a substrate and information elements describing physical analysis of each of said respective reference structural features (page 3, section 0026-0030), and (ii) information elements describing feedback from said respective structural features as a function of position over each of said respective reference structural features (page 3, section 0026-0027), (b) information elements in a computer-readable medium corresponding to at least one weighting function as a function of position over each of said respective reference structural features, and at least one correlation function as a function of

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position over each of said respective reference structural features, wherein a plurality of weighting functions and/or correlation functions is provided (page 3, section 0032-36), (c) means for determining a combination of weighting function and correlation function from said provided which provide a desired degree of correlation between said information elements (i) and (ii) for respective reference structural features (page 3, section 0032-0036), (d) information elements in a computer-readable medium describing feedback from said target structural features as a function of position over each of said respective target structural features on said substrate)page 3, section 0037), (e) means for applying said combination of weighting function and correlation function to said target structural feature information elements to predict said functional performance characteristic of respective target structural features and/or to describe said physical characteristic of respective target structural features (page 3, section 0032-0036, page 6, section 0057, page 30, section 0350, page 20, section 0229-0230).

Regarding claim 28:

Kikuchi discloses an apparatus for evaluation of target structural features on a substrate, said apparatus comprising (a) information elements in a computer-readable medium (fig. 1, unit 100, 120, 130) describing feedback from said target structural features as a function of position over each of said respective target structural features on said substrate (page 3, section 0026-27),

(b) means for applying a combination of weighting function and correlation function to said target structural feature information elements to predict a functional performance characteristic of respective target structural features and/or to describe a physical characteristic of respective target structural features (page 3, section 0032-0035, page 6, section 0057, page 30, section 0350, page 20, section 0229-0230).

Regarding claim 31:

Kikuchi discloses a computer program stored in a computer-readable medium, said program performing a method of evaluating target structural features on a substrate (fig. 1, unit 100, fig. 2), said method comprising (a) creating a calibration database (abstract) comprising (i) information elements selected from the group consisting of (A) information elements describing a functional performance characteristic of respective reference structural features on a substrate (page 3, section 0026-0029, page 30, section 0350), and (B) information elements describing a physical characteristic of each of said respective reference structural features, or both types of information elements (page 3, section, page 20, section 0229-0230), and (ii) information elements describing feedback from said respective reference structural features as a function of position over each of said respective reference structural features, (b) providing at least one weighting function as a function of position over each of said respective reference structural features and at least one correlation function

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as a function of position over each of said respective reference structural features (page 3, section 0032-0034, page 20, section 0229-0230), wherein a plurality of weighting functions, and/or correlation functions is provided, (c) determining a combination of weighting function and correlation function from said provided which provide a desired degree of correlation between said information elements (page 6, section 0057) (i) and (ii) for respective reference structural features (page 20, section 0229-0230), (d) obtaining information elements describing feedback from said target structural features as a function of position over each of said respective target structural features on said substrate, and (e) applying said combination of weighting function and correlation function to said target structural feature information elements to predict said functional performance characteristic of respective target structural features and/or to describe said physical characteristic of respective target structural features (page 20, section 0229-0230, page 3, section 0032-0035).

Regarding claim 32:

Kikuchi discloses a computer program stored in a computer- readable medium (fig. 1, unit 100), said program performing a method of evaluating target structural features on a substrate (abstract, fig. 3), said method comprising (a) obtaining information elements describing feedback from said target structural features as a function of position over each of said respective target structural features on said substrate (page 3, section 26-29), (b) applying a combination of

a weighting function and a correlation function to said target structural feature information elements to predict a functional performance characteristic of respective target structural features and/or to describe a physical characteristic of respective target structural features (page 20, section 0229-0230, page 6, section 0057, page 3, section 0032-0035).

Regarding claims 7, 9, 10, 11, 12, 13, 14, 15, 18, 21, 22, 23, 24:

Kikuchi discloses:

The method of claim 6 wherein a plurality of weighting functions and a plurality of correlation functions are provided in step (b) (page 3, section 0032-34).

The method wherein a value of said weighting function of said determined combination of step (c) is multiplied with a value of a respective information element in step (e) (page 3, section 0032-0035).

The method wherein said calibration database includes information elements describing a functional performance characteristic of respective reference structural features on a substrate (fig. 7), and said functional performance characteristic is predicted in step (e) (page 30, section 0350).

The method wherein said functional performance characteristic is the etchability across said target feature (page 30, section 0350).

The method wherein said structural features are holes in a resist layer on said substrate (page 30, section 0350).

The method wherein said functional performance characteristic is a response of each respective hole to an etching protocol (page 30, section 0350).

The method wherein all of said information elements are embodied in a computer-readable medium and steps (c) and (e) are performed using a computer (fig. 1, unit 100, 120, 130).

The method wherein said feedback of steps (a) and (e) comprises secondary electron emission from said structural features upon exposure to a scanning electron beam (page 30, section 0347).

Regarding claims 19, 20, 26, 27, 29, 30:

Kikuchi discloses:

The method wherein a functional performance characteristic is predicted in step (b) (page 30, section 0350).

The method wherein said functional performance characteristic is the etchability across said target feature (page 30, section 0350).

The system wherein said means (c) comprises executable code stored in a computer readable medium and a computer capable of executing said code (fig. 1, unit 100, 130, fig. 3).

The apparatus further comprising means for obtaining said information elements (page 3, section 0026-0030).

The apparatus wherein said means for obtaining said information elements includes a scanning electron beam (page 30, section 0350).

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

a. Claims 33, 34 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kikuchi (U.S. Patent Application 2002/0042664) in view of Kim (U.S. patent 6,581,023).

Kikuchi discloses a method, system and computer program including the subject matter discussed above except the measurement a depth profile across the structure; Kim discloses the measurement a depth profile across the structure (Col. 2, Lines 30-63), in order to increase the accuracy of the critical dimension of the IC (Col. 2, Lines 20-29).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Kikuchi to have the measurement a depth profile across the structure taught by Kim in order to increase the accuracy of the critical dimension of the IC (Col. 2, Lines 20-29).

Claim Objections

3. Claims 8 and 16 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all the limitation of the base claim and any intervening claims.

The following is an examiner's statement of reasons for allowance: prior art fail to teach the use of weighting functions are selected from the group consisting of continuous functions and discontinuous functions; the use of linear regression analysis.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Response to Arguments

4. Applicant's arguments with respect to claims 6-35 have been considered but are moot in view of the new ground(s) of rejection. However, applicant's arguments filed 9/9/2003 have been fully considered but they are not persuasive.

A. Applicant argues that the prior art does not show 'use of feedback elements from respective shots as a function of position over such features'; Kikuchi

discloses 'use of feedback elements from respective shots as a function of position over such features' in page 3, section 30-36, fig. 7, 8, 10, 11, 14, 15, 18).

B. Applicant argues that the prior art does not show the use of SEM; the examiner reminds to the applicant that it has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Ex parte Masham*, 2 USPQ2d-1647 (1987).

C. Applicant argues that the prior art does not show the prediction of etchability; Kikuchi shows the prediction of etchability in page 2-3, section 0025-0030.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will

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the statutory period for reply expire later than SIX MONTHS from the date of this final action.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tung S Lau whose telephone number is 703-305-3309. The examiner can normally be reached on M-F 9-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Barlow can be reached on 703-308-3126. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-5841 for regular communications and 703-308-5841 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

TC2800 RightFAX Telephone Numbers : TC2800 Official Before-Final RightFAX - (703) 872-9318, TC2800 Official After-Final RightFAX - (703) 872-9319

TC2800 Customer Service RightFAX - (703) 872-9317

TL

October 6, 2003


MICHAEL NGHIEM
PRIMARY EXAMINER